

WHAT IS CLAIMED IS:

1. An electron optical system array having a plurality of electron lenses, comprising:

5 a plurality of electrodes arranged along paths of a plurality of charged-particle beams,

wherein each of said plurality of electrodes has a membrane in which a plurality of apertures are formed on the paths of the plurality of charged-particle beams,  
10 and a support portion which supports the membrane, and at least two of said plurality of electrodes are arranged to form a nested structure.

2. The array according to claim 1, wherein the electron optical system array further  
15 comprises a base member, and

the support portions of said at least two electrodes which form the nested structure are supported by said base member.

3. The array according to claim 2, wherein the  
20 support portions of said at least two electrodes which form the nested structure are supported by one surface of said base member.

4. The array according to claim 1, wherein all said plurality of electrodes are arranged to form a nested  
25 structure.

5. The array according to claim 4, wherein the electron optical system array further

comprises a base member, and

the support portions of all said plurality of electrodes are supported by said base member.

6. The array according to claim 5, wherein the  
5 support portions of all said plurality of electrodes are supported by one surface of said base member.

7. The array according to claim 1, wherein said plurality of electrodes are arranged to form at least two nested structures.

10 8. The array according to claim 7, wherein the electron optical system array further comprises a base member having first and second surfaces, and

said base member supports one of the at least two  
15 nested structures by the first surface and supports the other one of the at least two nested structures by the second surface.

9. The array according to claim 7, further comprising at least two base members which respectively  
20 support the at least two nested structures.

10. The array according to claim 7, further comprising a coupling portion which couples the at least two nested structures.

11. The array according to claim 1, wherein  
25 the support portions of said at least two electrodes which form the nested structure have hollow portions, and

one electrode is arranged inside the hollow portion of the other electrode.

12. The array according to claim 2, wherein one of said plurality of electrodes except for said at least two electrodes which form the nested structure faces an electrode located farthest from said base member out of said at least two electrodes which form the nested structure.

13. The array according to claim 12, wherein the support portion of one of said plurality of electrodes except for said at least two electrodes which form the nested structure is smaller in size than the support portion of said electrode located farthest from said base member out of said at least two electrodes which form the nested structure.

14. The array according to claim 1, wherein said plurality of electrodes are arranged to prevent the membranes of said plurality of electrodes from contacting each other.

15. The array according to claim 1, wherein at least one of said plurality of electrodes is divided in units of columns each formed from a plurality of apertures.

16. The array according to claim 1, wherein the number of electrodes which form the nested structure is two.

17. The array according to claim 1, wherein the number of electrodes which form the nested structure is

three.

18. The array according to claim 1, wherein

at least one of said plurality of electrodes is  
an electrode for forming an electric field which acts  
5 on a charged-particle beam, and

at least another one of said plurality of  
electrodes is a shield electrode.

19. A method of manufacturing an electron optical  
system array having a plurality of electron lenses,  
10 comprising:

the preparation step of preparing a plurality of  
electrodes each having a membrane in which a plurality  
of apertures are formed, and a support portion which  
supports the membrane;

15 the step of preparing a base member; and

the fixing step of fixing the support portions of  
the plurality of electrodes to the base member so as to  
form a nested structure by all or some of the plurality  
of electrodes.

20 20. The method according to claim 19, wherein in the  
electrode preparation step, the plurality of electrodes  
are fabricated using plating.

21. A charged-particle beam exposure apparatus  
comprising:

25 a charged-particle beam source for emitting a  
charged-particle beam;

an electron optical system array which has a

plurality of electron lenses and forms a plurality of intermediate images of said charged-particle beam source by the plurality of electron lenses; and

a projection electron optical system for  
5 projecting on a substrate the plurality of intermediate images formed by said electron optical system array,

wherein said electron optical system array includes a plurality of electrodes arranged along paths of a plurality of charged-particle beams concerning the  
10 plurality of intermediate images,

each of said plurality of electrodes has a membrane in which a plurality of apertures are formed on the paths of the plurality of charged-particle beams, and a support portion which supports the membrane, and

15 at least two of said plurality of electrodes are arranged to form a nested structure.

22. A device manufacturing method comprising the steps of:

installing a plurality of semiconductor  
20 manufacturing apparatuses including a charged-particle beam exposure apparatus in a factory; and

manufacturing a semiconductor device by using the plurality of semiconductor manufacturing apparatuses,

wherein the charged-particle beam exposure  
25 apparatus includes

a charged-particle beam source for emitting a charged-particle beam,

an electron optical system array which has a plurality of electron lenses and forms a plurality of intermediate images of the charged-particle beam source by the plurality of electron lenses, and

5 a projection electron optical system for projecting on a substrate the plurality of intermediate images formed by the electron optical system array,

the electron optical system array includes a plurality of electrodes arranged along paths of a plurality of charged-particle beams concerning the  
10 plurality of intermediate images,

each of the plurality of electrodes has a membrane in which a plurality of apertures are formed on the paths of the plurality of charged-particle beams,  
15 and a support portion which supports the membrane, and

at least two of the plurality of electrodes are arranged to form a nested structure.

23. The method according to claim 22, further comprising the steps of:

20 connecting the plurality of semiconductor manufacturing apparatuses by a local area network;

connecting the local area network to an external network of the factory;

acquiring information about the charged-particle  
25 beam exposure apparatus from a database on the external network by using the local area network and the external network; and



each of said plurality of electrodes has a membrane in which a plurality of apertures are formed on the paths of the plurality of charged-particle beams, and a support portion which supports the membrane, and

5        at least two of said plurality of electrodes are arranged to form a nested structure.

25.    A maintenance method for a charged-particle beam exposure apparatus, comprising the steps of:

preparing a database for storing information  
10    about maintenance of the charged-particle beam exposure apparatus on an external network of a factory where the charged-particle beam exposure apparatus is installed;

connecting the charged-particle beam exposure apparatus to a local area network in the factory; and

15        maintaining the charged-particle beam exposure apparatus on the basis of the information stored in the database by using the external network and the local area network,

wherein the charged-particle beam exposure  
20    apparatus includes

a charged-particle beam source for emitting a charged-particle beam,

an electron optical system array which has a plurality of electron lenses and forms a plurality of  
25    intermediate images of the charged-particle beam source by the plurality of electron lenses, and

a projection electron optical system for



projecting on a substrate the plurality of intermediate images formed by the electron optical system array,

the electron optical system array includes a plurality of electrodes arranged along paths of a plurality of charged-particle beams concerning the plurality of intermediate images,

each of the plurality of electrodes has a membrane in which a plurality of apertures are formed on the paths of the plurality of charged-particle beams, and a support portion which supports the membrane, and

at least two of the plurality of electrodes are arranged to form a nested structure.